

FORM PTO-1390
(REV 10-94)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

10921.111USWO

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5)

UNKNOWN

10/030845

INTERNATIONAL APPLICATION NO.

PCT/JP00/04613

INTERNATIONAL FILING DATE

JULY 10, 2000

PRIORITY DATE CLAIMED

JULY 12, 1999

TITLE OF INVENTION

PROCESS FOR PRODUCING ADHESIVE FOR FUSION BONDING, ADHESIVE FOR FUSION BONDING OBTAINED BY THE PROCESS, AND ADHESIVE FABRIC CONTAINING THE ADHESIVE FOR FUSION BONDING

APPLICANT(S) FOR DO/EO/US

ARAKI, Eiichi; SUGIHARA, Norihiro; NAKAO, Kaichiro; MANABE, Hiroshi; TAKEI, Tooru

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☒ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98., Form 1449, 9 Reference(s)
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment, Marked Up Claims Page 27
☐ A SECOND of SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: Front Page of PCT/JP00/04613, PCT/ISA/210, PCT/IB/304, PCT/IB/308, PCT/IB/332, WO-SS2000-3, PCT/IPEA/409, English Translation of PCT/JP00/04613, Certification of Translation of the same.

U.S. APPLICATION NO. (If known, file 37CFR 1.53) UNKNOWN	INTERNATIONAL APPLICATION NO. PCT/JP00/04613	ATTORNEYS DOCKET NUMBER 10921.111USWO
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107030845

17. [X] The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)): Search Report has been prepared by the EPO or JPO.....\$890.00 International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)).....\$710.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$740.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO \$1040.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4).....\$100.00	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">CALCULATIONS</th> <th style="text-align: left;">PTO USE ONLY</th> </tr> <tr><td colspan="2" style="height: 100px;"></td></tr> </table>	CALCULATIONS	PTO USE ONLY		
CALCULATIONS	PTO USE ONLY				

ENTER APPROPRIATE BASIC FEE AMOUNT =	\$90.00
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	\$0

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	24	-20 = 0	X \$18.00	\$0	
Independent claims	1	-3 = 0	X \$84.00	\$0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)				+ \$260.00	\$0

TOTAL OF ABOVE CALCULATIONS =	\$890.00
Reduction by 1/2 for filing by small entity, if applicable. Small entity status is claimed pursuant to 37 CFR 1.27	\$0
SUBTOTAL =	\$890.00
Processing fee of \$130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).	+ \$0
TOTAL NATIONAL FEE =	\$890.00
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property	+ \$40.00
TOTAL FEES ENCLOSED =	\$930.00

	Amount to be refunded	\$0
	charged	\$0

a. [X] Check(s) in the amount of \$890.00 and \$40.00 to cover the above fees is enclosed.

b. [] Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
 A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 13-2725.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
 Douglas P. Mueller
 MERCHANT & GOULD
 P.O. Box 2903
 Minneapolis, MN 55402-0903

SIGNATURE:

NAME: Douglas P. Mueller

REGISTRATION NUMBER: 30,300

S/N unknown

JC12 Rec'd PCT/PTO 11 JAN 2002

10/030845

PATENT

#4/a

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Araki, et al.	Docket No.:	10921.111USWO
Serial No.:	unknown	Filed:	concurrent herewith
Int'l Appln No.:	PCT/JP00/04613	Int'l Filing Date:	July 10, 2000
Title:	PROCESS FOR PRODUCING ADHESIVE FOR FUSION BONDING, ADHESIVE FOR FUSION BONDING OBTAINED BY THE PROCESS, AND ADHESIVE FABRIC CONTAINING THE ADHESIVE FOR FUSION BONDING		

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EL669944227US

Date of Deposit: January 11, 2002

I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 and is addressed to the Commissioner for Patents, Washington, D.C. 20231.

By: 

Name: Chris Stordahl

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment:

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

IN THE CLAIMS

Please amend the claims as follows:

11. A heat-fusion bonding adhesive prepared by the manufacturing method defined in claim 1.

12. An adhesive fabric obtained by coating, on a surface of a base fabric, the heat-fusion bonding adhesive prepared by the manufacturing method defined in claim 1, and then thermally fusing the adhesive.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 11 and 12. Please refer to the Marked-Up claim page 27, attached herewith.

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

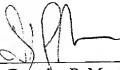
Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Douglas P. Mueller (Reg. No. 30,300), at (612) 612.371.5237.

Respectfully submitted,

MERCHANT & GOULD P.C.
Post Office Box 2903
Minneapolis, Minnesota 55402-0903
(612) 332-5300

Dated: January 11, 2002

By 
Douglas P. Mueller
Reg. No. 30,300

DPM/rw



MARKED UP VERSION

ethylene glycol, diethylene glycol, polyethylene glycol, 1,4-butane diol, and 1,6-hexane diol.

11. A heat-fusion bonding adhesive prepared by the
5 manufacturing method defined in claim 1 [any one of
claims 1 to 10].

12. An adhesive fabric obtained by coating, on a
surface of a base fabric, the heat-fusion bonding
10 adhesive prepared by the manufacturing method defined
in claim 1 [any one of claims 1 to 10], and then
thermally fusing the adhesive.

10/030845

Applicant: Araki, et al.

Docket: 10921.111USWO

Title: PROCESS FOR PRODUCING ADHESIVE FOR FUSION BONDING, ADHESIVE FOR FUSION BONDING OBTAINED BY THE PROCESS, AND ADHESIVE FABRIC CONTAINING THE ADHESIVE FOR FUSION BONDING

CERTIFICATE UNDER 37 CFR 1.10

Express Mail[®] mailing label number: EL669944227US

Date of Deposit: January 11, 2002

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By: 

Name: Chris Stordahl

BOX PATENT APPLICATION

Commissioner for Patents

Washington, D.C. 20231

Sir:

We are transmitting herewith the attached:

- ☒ Transmittal sheet, in duplicate, containing Certificate under 37 CFR 1.10.
- ☒ National Stage PCT Patent Application: Spec. 24 pgs; 12 claims; Abstract 1 pgs.
- The fee has been calculated as shown below in the 'Claims as Filed' table.
- ☒ Information Disclosure Statement, Form 1449, 9 Reference(s)
- ☒ A signed Combined Declaration and Power of Attorney
- ☒ Assignment of the invention to Sumitomo Seika Chemicals Co., Ltd., Recordation Form Cover Sheet
- ☒ A check in the amount of \$890.00 to cover the Filing Fee
- ☒ A check for \$40.00 to cover the Assignment Recording Fee.
- ☒ Other: Preliminary Amendment, Marked Up Claims Page 27, Front Page of PCT/JP00/04613, PCT/ISA/210, PCT/IB/304, PCT/IB/308, PCT/IB/332, WO-SS2000-3, PCT/IPEA/409, English Translation of PCT/JP00/04613, Certification of Translation of the same.
- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed	In Excess of:	Number Extra	Rate	Fee
Basic Filing Fee				\$890.00
Total Claims				
12	20	0	x 18.00	\$0.00
Independent Claims				
1	3	0	x 84.00	\$0.00
MULTIPLE DEPENDENT CLAIM FEE				\$0.00
TOTAL FILING FEE				\$890.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

MERCHANT & GOULD P.C.
P.O. Box 2903, Minneapolis, MN 55402-0903
(612) 332-5300

By: 

Name: Douglas P. Mueller

Reg. No.: 30,300

Initials: DPMueller/rw



23552

PATENT TRADEMARK OFFICE

(PTO TRANSMITTAL - NEW FILING)

Applicant: Araki, et al.
 Docket: 10921.111USWO
 Title:

531 Rec'd PCT/PT

11 JAN 2002

PROCESS FOR PRODUCING ADHESIVE FOR FUSION BONDING, ADHESIVE FOR
 FUSION BONDING OBTAINED BY THE PROCESS, AND ADHESIVE FABRIC
 CONTAINING THE ADHESIVE FOR FUSION BONDING

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EL669944227US

Date of Deposit: January 11, 2002

I hereby certify that this paper or fee is being deposited with the United States Postal Service 'Express Mail Post Office
 To Addressee' service under 37 CFR 1.10 and is addressed to the Commissioner for Patents, Washington, D.C. 20231.

By: 

Name: Chris Stordahl

BOX PATENT APPLICATION
 Commissioner for Patents
 Washington, D.C. 20231

Sir:

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- ☒ Return postcard

CLAIMS AS FILED

Number of Claims Filed	In Excess of:	Number Extra	Rate	Fee
Basic Filing Fee				\$890.00
Total Claims				
12	20	0	x 18.00	\$0.00
Independent Claims				
1	3	0	x 84.00	\$0.00
MULTIPLE DEPENDENT CLAIM FEE				\$0.00
TOTAL FILING FEE				\$890.00

Please charge any additional fees or credit overpayment to Deposit Account No. 13-2725. A duplicate of this sheet is enclosed.

MERCHANT & GOULD P.C.
 P.O. Box 2903, Minneapolis, MN 55402-0903
 (612) 332-5300

By: 

Name: Douglas P. Mueller
 Reg. No.: 30,300
 Initials: DPMueller/rw



23552

PATENT TRADEMARK OFFICE

(PTO TRANSMITTAL - NEW FILING)

DESCRIPTION

10/050845

METHOD FOR MANUFACTURE OF HEAT-FUSION BONDING ADHESIVE,
HEAT-FUSION BONDING ADHESIVE OBTAINED BY THIS METHOD,
5 AND ADHESIVE FABRIC USING SUCH HEAT-FUSION BONDING
ADHESIVE

TECHNICAL FIELD

10 The present invention relates to a method for the
manufacture of a heat-fusion bonding adhesive. Further,
the present invention also relates to a heat-fusion
bonding adhesive obtained by this method. Moreover, the
present invention also relates to a heat-fusion bonding
adhesive obtained by thermally fusing the heat-fusion
15 bonding adhesive to the surface of a base fabric.

BACKGROUND ART

Base materials of various types have been provided
with a variety of functional properties such as oil
20 resistance, solvent resistance, chemical resistance,
wear resistance, gas shielding ability, adhesive
properties, and the like by coating a thermoplastic
resin thereon and forming a coating film. Among them,
adhesive fabrics obtained by using a fiber-containing
25 cloth or nonwoven fabric as a base fabric and coating a
thermoplastic resin on the surface of the base fabric
have been used mainly as adhesive interlinings in the
field of clothing.

For example, Japanese Patent Application Laid-open No. H6-145413 disclosed an adhesive interlining fabricated by the following method. First, a composition prepared by adding silica and a silane
5 coupling agent to an acrylic polymer emulsion such as acrylate resin was coated on a fiber-containing nonwoven fabric serving as a base fabric and dried. Then, a powder of a thermoplastic resin such as a
10 ethylene-vinyl acetate resin, polyvinyl chloride resin, and the like was scattered over the coating and melted to obtain an adhesive interlining.

A variety of methods such as a scattering method, powder dot method, spray method, paste dot method,
15 double dot method, and the like are employed for heating and fusing the thermoplastic resin powder to the base fabric surface, and the appropriate method is selected according to the type of base fabric. With the scattering method, a thermoplastic resin powder is
20 uniformly scattered over the base fabric surface, heated, and fused. With the powder dot method, a thermoplastic resin powder is first caused to adhere to a gravure roll, then transferred to the base fabric surface, heated, and fused. With the spray method, a
25 paste prepared by dispersing a thermoplastic resin powder in water is sprayed as-is on the base fabric surface, thermally dried, and fused. With the paste dot method, a paste prepared by dispersing a thermoplastic

resin powder in water is dot-like coated on the base fabric surface by using a coating screen having fine holes, thermally dried, and fused. The double dot method comprises the steps of dot-like coating an
5 acrylic emulsion on the base fabric surface by using a coating screen having fine holes, scattering a thermoplastic resin powder over the obtained dot-like coating, removing the excess thermoplastic resin powder, and thermally drying and fusing the thermoplastic resin
10 powder remaining on the base fabric. The thermoplastic resin powder thermally fused to the base fabric surface by those methods is used as a heat-fusion bonding adhesive and thermally fuses the base fabric to a surface fabric when reheated during usage.

15 Adhesive fabrics, in particular, adhesive interlinings mainly serve to supplement the properties of the surface fabrics in order to give a final three-dimensional touch to a dress, to facilitate sewing and also to provide shape stability so as to prevent loss
20 of shape in wearing or washing and dry cleaning. They are usually used for collars, cuffs, lapels of men's business suits, women's suits and the like and the required properties thereof differ depending on the application and place where they are used. For this
25 reason, the optimum adhesive interlining is selected upon consideration of various conditions such as the type of thermoplastic resin powder, heat sealing method, type of base fabric, and the like.

The thermoplastic resin powder can be prepared by a mechanical grinding method by which a thermoplastic resin such as a copolyamide resin, copolyester resin, ethylene-vinyl acetate copolymer resin, polyethylene resin, polyurethane resin, and the like is mechanically ground at normal temperature, or by a freeze grinding method by which grinding is conducted under freezing.

In recent years, in addition to the above-mentioned application to women's suits, thin cloths for women have been actively developed and a need has increased for adhesive interlinings which do not degrade aesthetic shaping ability that provides feel and draping ability necessary to obtain beautiful silhouette and aesthetic functions especially required for clothing. However, when a thermoplastic resin powder is used as a hot-sealable adhesive, the resin powder is required to have a weight-average particle size of no more than 20 μ m if an adhesive interlining with a satisfactory feel is to be obtained. However, such a fine resin powder is very difficult to manufacture by the mechanical grinding method or freeze grinding method.

Adhesive interlining prepared by thermally fusing a thermoplastic resin powder with relatively coarse particles having a size within a range of 60-500 μ m to the surface of a base fabric, for example, by a scattering method is typically used in clothing such as women's suits. However, if such an adhesive interlining

is used for thin cloths, in particular, thin cloths for women, satisfactory feel is difficult to obtain. Thus, the cloths become rigid to the touch and problems are associated with their draping ability.

5 Furthermore, in the powder dot method, in order to improve powder separation when the powder is transferred from the gravure roll onto the base fabric, the base fabric has to be preheated to a temperature of 180-250°C. Certain basic fabrics are shrunk by such
10 preheating and the feel thereof is degraded.

On the other hand, the paste dot method uses a paste of a resin powder with a comparatively small particle size within a range of 5-80µm, which somewhat improves the feel. However, though the particle size
15 range is referred to as a 5-80µm range, the peak of particle size distribution within the range is actually shifted to a large size. As a result, the weight-average particle size is usually about 30-50µm, easily causing clogging of fine openings in the coating screen.
20 For this reason, it is difficult to employ the screens with fine holes having a diameter of no more than 200µm. As a result, dot spacing is increased which results in a decreased adhesive force and degraded feel.

Furthermore, paste-like adhesives used in the
25 spray or paste dot method are manufactured by dispersing a thermoplastic resin powder in water. As a result, it is difficult to increase the resin

concentration to more than 40wt%. Therefore, drying is time consuming and productivity is poor.

The double dot method resolves the above-described problems. With this method, a resin powder is scattered
5 over an acrylic resin coating obtained by dot-like coating and the resin powder which adhered only to the zones coated with the acrylic resin is used as a hot-sealable adhesive. If the excess powdered resin is removed by suction after scattering, the resin powder
10 should remain only on the acrylic resin dots. However, in reality, the powder cannot be completely removed by suction and the powder remaining outside the dots degrades the feel. Another problem is that the resin powder that adhered to the acrylic resin can peel
15 therefrom, decreasing the adhesive strength.

DISCLOSURE OF THE INVENTION

It is an object of the present invention to provide a method for manufacturing a heat-fusion
20 bonding adhesive suitable for obtaining adhesive interlinings which do not degrade the feel of the clothing, maintain shape stability, and demonstrate sufficient draping ability even when the adhesive is used for thin cloths, in particular, thin cloths for
25 women.

Another object of the present invention is to provide a heat-fusion bonding adhesive obtained by such manufacturing method.

Still another object of the present invention is to provide an adhesive fabric obtained by heating and fusing such heat-fusion bonding adhesive to the surface of a base fabric.

5 In accordance with the first aspect of the present invention, a method is provided for manufacturing a heat-fusion bonding adhesive for thermally fusing a base fabric to a surface fabric, comprising the steps of heating a thermoplastic resin to a temperature of no
10 less than the softening point of the resin and dispersing it in the softened state in an aqueous medium.

In accordance with the second aspect of the present invention, it provides a heat-fusion bonding
15 adhesive consisting of the aqueous dispersion of a thermoplastic resin obtained by the above-described manufacturing method.

No specific limitation is placed on the thermoplastic resin used in accordance with the present
20 invention. Examples of suitable resins include copolyamide resins, copolyester resins, ethylene-vinyl acetate copolymer resins, polyethylene resins, polyurethane resins, and the like. Those resins may be used individually or in a mixture thereof. When a
25 thermoplastic resin is used in a heat-fusion bonding adhesive for the fabrication of an adhesive fabric, it is preferred that copolyamide resins, copolyester resins, and mixtures thereof be used because of their

capability to maintain a good thin cloth feel and resistance to dry cleaning and washing.

No specific limitation is placed on copolyamide resins. Suitable examples include copolyamide resins comprising structural units of at least two types selected from the group consisting of $-\text{[NH(CH}_2\text{)}_5\text{CO]}-$, $-\text{[NH(CH}_2\text{)}_6\text{NHCO(CH}_2\text{)}_4\text{CO]}-$, $-\text{[NH(CH}_2\text{)}_6\text{NHCO(CH}_2\text{)}_5\text{CO]}-$, $-\text{[NH(CH}_2\text{)}_{10}\text{CO]}-$, and $-\text{[NH(CH}_2\text{)}_{11}\text{CO]}-$. Specific examples include 6/66 copolymer nylon, 6/610 copolymer nylon, 6/11 copolymer nylon, 6/12 copolymer nylon, 6/66/610 copolymer nylon, 6/66/11 copolymer nylon, 6/66/12 copolymer nylon, 6/66/11/12 copolymer nylon, 6/66/610/11/12 copolymer nylon, and polyamide elastomers which are the copolymers of those copolymer nylons and polyesters or polyalkylene ether glycols. Among them, 6/66/11 copolymer nylon, 6/66/12 copolymer nylon, and 6/66/11/12 copolymer nylon are preferred, and 6/66/12 copolymer nylon is especially preferred.

No specific limitation is placed on the copolyester resins. Examples of suitable copolyester resins include copolyester resins obtained by polycondensation of (A) an acid component comprising terephthalic acid and isophthalic acid and (B) a diol component such as ethylene glycol, diethylene glycol, polyethylene glycol, 1,4-butane diol or 1,6-hexane diol. Specific examples include terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin, terephthalic acid/isophthalic acid/1,6-hexane diol copolyester resin,

terephthalic acid/isophthalic acid/polyethylene glycol
copolyester resin, terephthalic acid/isophthalic
acid/ethylene glycol/1,4-butane diol copolyester resin,
terephthalic acid/isophthalic acid/adipic acid/1,4-
5 butane diol copolyester resin, and terephthalic
acid/isophthalic acid/1,4-butane diol/diethylene glycol
copolyester resin. Among them, terephthalic
acid/isophthalic acid/1,4-butane diol copolyester resin,
terephthalic acid/isophthalic acid/ethylene glycol/1,4-
10 butane diol copolyester resin, and terephthalic
acid/isophthalic acid/1,4-butane diol/diethylene glycol
copolyester resin are preferred, and terephthalic
acid/isophthalic acid/1,4-butane diol copolyester resin
is especially preferred.

15 In the manufacturing method in accordance with the
present invention, the thermoplastic resin can be
dispersed in an aqueous medium by heating the
thermoplastic resin to a temperature of no less than
the softening point thereof to obtain a softened state
20 and then applying a shear force to the aqueous medium.
In this process, the thermoplastic resin preheated to a
temperature of no less than the softening point thereof
may be added to the similarly heated aqueous medium
under stirring, or the thermoplastic resin may be added
25 to the aqueous medium under stirring and then heated
together with the aqueous medium to a temperature of no
less than the softening point thereof. Furthermore,
when the thermoplastic resin is an ethylene-vinyl

acetate copolymer resin, a polyethylene resin which is not terminated with a functional group, and the like, a surfactant or a dispersing agent may be added, if necessary, to the aqueous medium to accelerate the dispersion process. Furthermore, when the thermoplastic resin is a copolyamide resin or copolyester resins terminated with a carboxyl group, a basic substance may be added to the aqueous medium in addition to or instead of the surfactant or dispersing agent.

Examples of the surfactants include anionic surfactants (for example, rosin acid salts, fatty acid salts, alkylbenzenesulfonates), cationic surfactants (for example, dodecyltrimethylammonium chloride), nonionic surfactants (for example, ethylene oxide-propylene oxide block copolymer, polyoxyethylene alkyl ethers, glycerin fatty acid esters, polyoxyethylene fatty acid ethanolamides), amphoteric surfactants (for example, N-alkyl-N,N-dimethylammonium betaine).

Examples of dispersing agents include polymer dispersing agents such as polyacrylic acid salts, polystyrenesulfonic acid salts, polystyrene maleic anhydride salts, polyvinyl alcohol, hydroxyethyl cellulose, and the like, and inorganic dispersing agents such as alumina sol, silica sol, calcium phosphate, and the like.

Examples of basic substances include alkali metal hydroxides, such as sodium hydroxide or potassium hydroxide, ammonia, and amines. From the standpoint of

dispersing effect, alkali metal hydroxides such as sodium hydroxide or potassium hydroxide are preferred.

In the manufacturing method in accordance with the present invention, good results are obtained if
5 dispersing of the thermoplastic resin in the aqueous medium is conducted at a temperature of no less than the softening point thereof, usually, at 50-300°C, preferably, 70-220°C. When the temperature is less than 50°C, softening of the thermoplastic resin in the
10 aqueous medium is insufficient and, therefore, homogeneous dispersion cannot be obtained. When the temperature is higher than 300°C, the thermoplastic resin is degraded which is undesirable.

Furthermore, the amount of the aqueous medium used
15 in the manufacturing method in accordance with the present invention is usually 30-1500 weight parts, preferably, 100-500 weight parts per 100 weight parts of thermoplastic resin. If the amount of water used is less than 30 weight parts, the thermoplastic resin
20 cannot be completely dispersed in water, and if the amount is above 1500 weight parts, the concentration of the obtained aqueous dispersion thermoplastic resin is low which is undesirable for usage.

In the manufacturing method in accordance with the
25 present invention, the weight-average particle size of resin particles in the aqueous dispersion of thermoplastic resin can be randomly adjusted, for example, by controlling heating or stirring conditions.

It is usually adjusted to 0.1-20 μ m, preferably, 0.1-10 μ m. If the weight-average particle size of resin particles in the aqueous dispersion of thermoplastic resin is less than 0.1 μ m, the particles cohere and gelling easily occurs. As a result, a high resin concentration is difficult to obtain. If the weight-average particle size of resin particles in the aqueous dispersion of thermoplastic resin is more than 20 μ m, fine holes in the screen used for coating are easily clogged and the adhesive force of the base fabric is decreased or the feel is degraded which is undesirable.

The heat-fusion bonding adhesive in accordance with the present invention is usually used upon compounding a viscosity-adjusting agent and adjusting the viscosity to 5000-50,000mPa \cdot sec. If the viscosity is less than 5000mPa \cdot sec, the amount infiltrated into the base fabric becomes too high, the fabric feels rigid, and the formation of dots is insufficient. If the viscosity is higher than 50,000mPa \cdot sec, coating on the base fabric becomes difficult.

The compounded amount of the viscosity-adjusting agent is usually 0.01-5 weight parts based on 100 weight parts of the aqueous dispersion of thermoplastic resin, so as to obtain the above-described viscosity range. Examples of viscosity-adjusting agents include natural or synthetic polymeric thickening agents such as polyacrylamides, sodium polyacrylate, carboxymethyl cellulose, carboxyethyl cellulose, hydroxyethyl

cellulose, polyacrylic acid esters, polyethylene oxide, and ethylene oxide-propylene oxide random copolymer. If necessary, a plasticizer, a dispersing enhancer, an antifoaming agent, a softening agent, a stabilizer, and the like may be also compounded.

Furthermore, the concentration of the obtained aqueous dispersion of thermoplastic resin may be randomly adjusted by using an appropriate concentration means, for example, by using a semipermeable membrane.

Alternatively, the aqueous dispersion of thermoplastic resin can be used after finely powdering it with drying means, for example, by conducting spray drying of the aqueous dispersion of thermoplastic resin (with or without concentration) as is or upon solid-liquid separation by a centrifugal separation process or by filtration.

In accordance with the third aspect of the present invention, it provides an adhesive fabric obtained by coating the hot-sealable adhesive on the surface of a base fabric and thermally fusing. The adhesive fabric thus obtained can be advantageously used, in particular, as an adhesive interlining which does not degrade the feel of thin cloth.

No specific limitation is placed on the base fabric used as the adhesive fabric in accordance with the present invention. Thus, cloths or nonwoven fabrics using various fiber materials can be used. Examples of fiber materials include natural fibers such as cotton,

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hemp, silk, wool, and the like, regenerated fibers such as rayon, cupra, and the like, semisynthetic fibers such as acetate, triacetate, and the like, and synthetic fibers such as polyesters, nylon, acryl, urethane, polypropylene, polyethylene, polyvinyl chloride, and the like. Examples of woven fabrics include fabrics or cloths produced from the fiber materials, and examples of nonwoven fabrics include webs in which fiber materials are interwoven by chemical methods, mechanical methods, or combinations thereof.

No specific limitation is placed on the method for coating the heat-fusion bonding adhesive on the base fabric. However, since the heat-fusion bonding adhesive in accordance with the present invention is obtained as an aqueous dispersion, the especially preferred results are obtained when it is thermally fused to the base fabric surface by the paste dot method. With the paste dot method, a heat-fusion bonding adhesive is introduced into a rotary screen having a plurality of fine holes and extruded onto a base fabric through the fine holes of the rotary screen to obtain a dot-like coating.

The diameter of fine holes in the rotary screen is usually about 200 μ m. Utilizing the heat-fusion bonding adhesive in accordance with the present invention makes it possible to use a screen with a mesh size of about 50-200 μ m. Furthermore, the dot density is usually 50-

120 dots/cm² of base fabric, but utilizing the heat-fusion bonding adhesive in accordance with the present invention makes it possible to obtain a coating with a maximum of about 4000 dots/cm². The coating weight is usually 10-20g/m², but utilizing the heat-fusion bonding adhesive in accordance with the present invention makes it possible to obtain a sufficient adhesive force even at a coating weight of no more than 5g/m², the result depending on the type of base fabric.

If the base fabric is heated to a temperature of 80-150°C upon coating the heat-fusion bonding adhesive on the base fabric, the heat-fusion bonding adhesive is dried, melted, and fused to the base fabric, producing the target adhesive fabric. The obtained adhesive fabric can be adhesively bonded, for example, as an adhesive interlining, with an iron or a hot press to a variety of different surface fabrics, providing for a very good finish feel when used for thin cloth, in particular, thin cloth for women.

BEST MODE FOR CARRYING OUT THE INVENTION

The present invention will be described below in greater details based on examples thereof and comparative examples. The present invention is, however, not limited to those examples.

(Example 1 : Preparation of aqueous dispersion of thermoplastic resin)

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A total of 150 kg of 6/66/12 copolyamide (softening point 130°C), 149.6kg of water, and 0.4kg of sodium hydroxide were charged and sealed in a pressure-resistant autoclave equipped with a jacket, having an inner diameter of 700mm, a height of 1500mm, and an inner capacity of 0.45m³, and provided with a turbine-type stirring impeller with a diameter of 350mm. The stirrer was then activated and the temperature inside the autoclave was raised to 150°C by circulating a heated oil in the jacket, while conducting stirring at a rate of 150 revolutions per minute. The stirring was further conducted for 30 minutes, while the internal temperature was maintained at 150°C. Then, the contents was cooled to 50°C and an aqueous dispersion of 6/66/12 copolyamide resin with a resin concentration of 50wt% was obtained.

The weight-average particle size of the obtained aqueous dispersion of 6/66/12 copolyamide resin was measured with a particle size measurement apparatus of a laser diffraction type (manufactured by Shimadzu Corporation, model SALD 2000); the weight-average particle size was 1.2μm.

(Example 2 : Preparation of aqueous dispersion of thermoplastic resin)

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A total of 150kg of terephthalic acid/isophthalic acid/1,4-butane diol copolyester (softening point 90°C), 120kg of water, and 30kg of ethylene oxide - propylene oxide block copolymer as a surfactant were charged and sealed in a pressure-resistant autoclave equipped with a jacket, having an inner diameter of 700mm, a height of 1500mm, and an inner capacity of 0.45m³, and provided with a turbine-type stirring impeller with a diameter of 350mm. The stirrer was then activated and the temperature inside the autoclave was raised to 150°C by circulating a heated oil in the jacket, while conducting stirring at a rate of 150 revolutions per minute. The stirring was further conducted for 30 minutes, while the internal temperature was maintained at 150°C. Then, the contents was cooled to 50°C and an aqueous dispersion of terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin with a resin concentration of 50wt% was obtained.

The weight-average particle size of the obtained aqueous dispersion of terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin was measured with a particle size measurement apparatus of a laser diffraction type (manufactured by Shimadzu Corporation, model SALD 2000); the weight-average particle size was 2.5µm.

(Example 3 : Fabrication of adhesive fabric)

A total of 0.2 weight parts of sodium polyacrylate was added to 100 weight parts of the aqueous dispersion of 6/66/12 copolyamide resin obtained in Example 1 and a paste-like heat-fusion bonding adhesive with a viscosity of 22,000mPa·sec was obtained.

The obtained heat-fusion bonding adhesive was dot-like coated on the surface of a nylon nonwoven fabric with a weight of 25g/m² by using a screen with a fine hole diameter of 80μm. The dot density was 300 dots/cm² and the coating weight was 5g/m². The adhesive fabric was then obtained by drying and fusing for 1 minute at a temperature of 150°C.

(Example 4 : Fabrication of adhesive fabric)

A total of 0.2 weight parts of sodium polyacrylate was added to 100 weight parts of the aqueous dispersion of terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin obtained in Example 2 and a paste-like heat-fusion bonding adhesive with a viscosity of 20,000mPa·sec was obtained.

The obtained heat-fusion bonding adhesive was dot-like coated on the surface of a polyester nonwoven fabric with a weight of 25g/m² by using a screen with a fine hole diameter of 80μm. The dot density was 300 dots/cm² and the coating weight was 5g/m². The adhesive fabric was then obtained by drying and fusing for 1 minute at a temperature of 150°C.

(Example 5 : Fabrication of adhesive fabric)

5 A total of 0.2 weight parts of sodium polyacrylate was added to a liquid mixture of 50 weight parts of the aqueous dispersion of 6/66/12 copolyamide resin obtained in Example 1 and 50 weight parts of the aqueous dispersion of terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin obtained in Example 2 and a paste-like heat-fusion bonding adhesive with a viscosity of 20,000mPa·sec was obtained.

10 The obtained heat-fusion bonding adhesive was dot-like coated on the surface of a nylon nonwoven fabric with a weight of 25g/m² by using a screen with a fine hole diameter of 80μm. The dot density was 300 dots/cm² and the coating weight was 5g/m². The adhesive fabric
15 was then obtained by drying and fusing for 1 minute at a temperature of 150°C.

(Example 6 : Fabrication of adhesive fabric)

20 A total of 1 weight part of polyethylene oxide (trade name PEO-18, manufactured by Sumitomo Seika Chemicals Co., Ltd.) was added to a liquid mixture of 90 weight parts of the aqueous dispersion of 6/66/12 copolyamide resin obtained in Example 1 and 10 weight parts of ethylene-vinyl acetate copolymer emulsion
25 (trade name Sepolsion V, manufactured by Sumitomo Seika Chemicals Co., Ltd.) and a paste-like heat-fusion bonding adhesive with a viscosity of 23,000mPa·sec was obtained.

(Comparative Example 2)

A 6/66/12 copolyamide resin (softening temperature 130°C) was frozen, ground and then classified through a standard sieve with a mesh size of 80µm to obtain a
5 6/66/12 copolyamide resin powder with a weight-average particle size of 45µm. A total of 64.8 weight parts of water and 0.2 weight parts of sodium polyacrylate were added to 35 weight parts of the obtained 6/66/12 copolyamide resin powder and the components were
10 stirred to obtain a paste-like heat-fusion bonding adhesive with a viscosity of 23,000mPa·sec.

The obtained heat-fusion bonding adhesive was dot-like coated on the surface of a nylon nonwoven fabric with a weight of 25g/m² at a dot density of 150
15 dots/cm² and a coating weight of 10g/m² by using a screen with a fine hole diameter of 200µm. The adhesive fabric was then obtained by drying and fusing for 2 minutes at a temperature of 150°C.

20 (Comparative Example 3)

A terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin (softening temperature 90°C) was frozen, ground and then classified through a standard sieve with a mesh size of 80µm to obtain a terephthalic
25 acid/isophthalic acid/1,4-butane diol copolyester resin powder with a weight-average particle size of 42µm. A total of 64.8 weight parts of water and 0.2 weight parts of sodium polyacrylate were added to 35 weight

parts of the obtained terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin powder and the components were stirred to obtain a paste-like heat-fusion bonding adhesive with a viscosity of 22,000mPa·sec.

The obtained heat-fusion bonding adhesive was dot-like coated on the surface of a polyester nonwoven fabric with a weight of 25g/m² at a dot density of 300 dots/cm² and a coating weight of 5g/m² by using a screen with a fine hole diameter of 80μm. However, the screen was partially clogged and dot-like coating was impossible.

(Comparative Example 4)

A terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin (softening temperature 90°C) was frozen, ground and then classified through a standard sieve with a mesh size of 80μm to obtain a terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin powder with a weight-average particle size of 42μm. A total of 64.8 weight parts of water and 0.2 weight parts of sodium polyacrylate were added to 35 weight parts of the obtained terephthalic acid/isophthalic acid/1,4-butane diol copolyester resin powder and the components were stirred to obtain a paste-like heat-fusion bonding adhesive with a viscosity of 23,000mPa·sec.

The obtained heat-fusion bonding adhesive was dot-like coated on the surface of a polyester nonwoven fabric with a weight of 25g/m² at a dot density of 150 dots/cm² and a coating weight of 10g/m² by using a screen with a fine hole diameter of 200μm. The adhesive fabric was then obtained by drying and fusing for 2 minutes at a temperature of 150°C.

(Evaluation)

- 10 Feel of the adhesive fabrics obtained in Examples 3-6 and Comparative Examples 1-4 was evaluated by the following method. The results are shown in Table 1.

FEEL EVALUATION METHOD

- 15 Evaluation was conducted by a functional test based on the following criteria:

◎ : softness of cloth is fully maintained.

△ : feels slightly stiff.

× : stiff.

TABLE 1

No.	Feel Evaluation
Example 3	◎
Example 4	◎
Example 5	◎
Example 6	◎
Comparative Example 1	-
Comparative Example 2	△~×
Comparative Example 3	-
Comparative Example 4	△~×

As described above, in Examples 3-6 of the present invention, the thermoplastic resin in the aqueous medium (heat-fusion bonding adhesive) had a weight-average particle size of 0.1-20 μ m and was dispersed uniformly. Therefore, when coating is conducted by the paste dot method, screen clogging hardly occurs and the adhesive can be coated on the surface of a basic fabric in the form of small dots and with a high density. As a result, when the obtained adhesive fabric is used as an adhesive interlining of thin cloths, in particular, thin cloths for women, excellent characteristics can be provided. Thus, aesthetic shaping ability which provides feel and draping ability necessary to obtain beautiful silhouette and aesthetic functions required for clothing is not degraded. By contrast, in comparative Examples 1-4, the heat-fusion bonding adhesive could not be coated on a basic fabric, or even when it could be coated, the feel was degraded.

CLAIMS

1. A method for manufacturing a heat-fusion bonding adhesive comprising the steps of heating a thermoplastic resin to a temperature of no less than a softening point of the resin, and dispersing the resin in the softened state in an aqueous medium to obtain an aqueous dispersion of the thermoplastic resin.

2. The manufacturing method according to claim 1, wherein the dispersing of said thermoplastic resin in said aqueous medium is conducted by applying a shear force to said aqueous medium by stirring.

3. The manufacturing method according to claim 2, wherein the stirring of said aqueous medium is conducted till said thermoplastic resin is divided into particles with a weight-average particle diameter of 0.1-20 μ m.

4. The manufacturing method according to claim 1, wherein at least one of a surfactant, a dispersing agent, and a basic substance is added to said aqueous medium.

5. The manufacturing method according to claim 1, wherein said thermoplastic resin is softened by being heated to a temperature of 50-300°C.

6. The manufacturing method according to claim 1, wherein the ratio of said aqueous medium is 30-1500 weight parts per 100 weight parts of said thermoplastic resin.

5

7. The manufacturing method according to claim 1, wherein the viscosity of said aqueous medium is adjusted to 5000-50,000mPa·sec by the addition of a viscosity-adjusting agent.

10

8. The manufacturing method according to claim 1, wherein said thermoplastic resin is selected from the group consisting of copolyamide resins, copolyester resins, and mixtures thereof.

15

9. The manufacturing method according to claim 8, wherein said copolyamide resin has structural units of at least two types selected from the group consisting of

$-\text{[NH(CH}_2\text{)}_5\text{CO]}-$, $-\text{[NH(CH}_2\text{)}_6\text{NHCO(CH}_2\text{)}_4\text{CO]}-$, $-$
20 $[\text{NH(CH}_2\text{)}_6\text{NHCO(CH}_2\text{)}_8\text{CO]}-$, $-\text{[NH(CH}_2\text{)}_{10}\text{CO]}-$, and $-$
 $[\text{NH(CH}_2\text{)}_{11}\text{CO]}-$.

25

10. The manufacturing method according to claim 8, wherein said copolyester resin is a resin obtained by polycondensation of an acid component comprising terephthalic acid and isophthalic acid and a diol component selected from the group consisting of

ethylene glycol, diethylene glycol, polyethylene glycol,
1,4-butane diol, and 1,6-hexane diol.

11. A heat-fusion bonding adhesive prepared by the
5 manufacturing method defined in any one of claims 1 to
10.

12. An adhesive fabric obtained by coating, on a
surface of a base fabric, the heat-fusion bonding
10 adhesive prepared by the manufacturing method defined
in any one of claims 1 to 10, and then thermally fusing
the adhesive.

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Declaration and Power of Attorney For Patent Application

特許出願宣言書

Japanese Language Declaration

私は、下欄に氏名を記載した発明者として、以下のとおり宣言する：

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

その明細書を
(該当する方に印を付す)

☐ここに添付する。

☐ _____ 日に出席番号
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PCT第19条に基づき _____ 日に補正した。
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私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

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As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

METHOD FOR MANUFACTURE OF HEAT-FUSION

BONDING ADHESIVE, HEAT-FUSION BONDING

ADHESIVE OBTAINED BY THIS METHOD, AND

ADHESIVE FABRIC USING SUCH HEAT-FUSION

BONDING ADHESIVE

the specification of which
(check one)

☐ is attached hereto.

☐ was filed on _____ as

Application Serial No. _____

and was amended on _____

(if applicable)

☒ was described and claimed in PCT international application No. PCT/JP00/04613

filed on July 10, 2000

and as amended under PCT Article 19 or 34 on _____

(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, § 1.56(a).

Japanese Language Declaration

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I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(a)-(b) of any foreign application(s) for patent or inventor's certificate, or of any PCT international application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate or PCT international application having a filing date before that of the application on which priority is claimed:

Prior foreign applications

先の外国出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
Patent Application No. 11-196969	Japan	12/07/1999
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)

Priority claimed

優先権の主張

<input checked="" type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし

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I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending, abandoned)
(Application Serial No.) (出願番号)	(Filing Date) (出願日)	(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending, abandoned)

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(代理人氏名および登録番号を明記のこと)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

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Gorman, Alan G.	Reg. No. 38,472	Phillips, Bryan K.	Reg. No. P-46,990	Witz, Jonelle	Reg. No. 41,980
Gould, John D.	Reg. No. 18,223	Phillips, John B.	Reg. No. 37,206	Wu, Tong	Reg. No. 43,161
Gregson, Richard	Reg. No. 41,804	Plunkett, Theodore	Reg. No. 37,209	Xu, Min S.	Reg. No. 39,336
Greenis, John J.	Reg. No. 33,112	Prendergast, Paul	Reg. No. 46,068	Zeuli, Anthony R.	Reg. No. 45,255
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Japanese Language Declaration

唯一のまたは第一の発明者の氏名	1-00	Full name of sole or first inventor <u>Eiichi Araki</u>
同発明者の署名	日付	Inventor's signature <u>Eiichi Araki</u> Date January 7, 2002
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第5の共同発明者の氏名 (該当する場合)	5-00	Full name of fifth joint inventor, if any <u>Tooru Takei</u>
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